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Technique for Area Planning: An Economic Impact Analysis Technique

Regional Economic Development Institute, Inc.

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REGIONAL ECONOMIC DEVELOPMENT INSTITUTE, INCORPORATED

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TECHNIQUE FOR AREA PLANNING: AN ECONOMIC IMPACT ANALYSIS TECHNIQUE

INTRODUCTION

Dead Man's Fang, Arizona is seething with dissension. In every office, at the barbershops, up and down the main street, and across back fences throughout suburbia, one question is on everyone's lips: which firm do you favor? Mr. Jones, a local banker and head of the Dead Man's Fang Ad-hoc Committee to Change Our Name, feels one firm should be chosen. Mr. Hudson, professional engineer and President of the Lower West Side Junior Chamber of Commerce, sees merit in choosing another firm. Mr. Witherspoon, Junior Assistant Manager of the Holiday Hills J. C. Penney Store and Co-chairman of the Committee to Stamp Out Big Government, disagrees with both.

You may wonder at the uproar, for Dead Man's Fang (as we all know) is a very stable community. You may also puzzle over the specific question which has so undermined local tranquility. Let us outline the steps which have brought the community to its present predicament.

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Dead Man's Fang has been burdened for several years with persistent unemployment. An industrial development program has been initiated. A site has been acquired by the community and can be made available to one of three interested industrial firms.

An existing local food processing firm is interested in the site as a location for an expanded and modernized food processing facility. Officials of the firm estimate new employment of about 80 men.

A radio and television assembly firm is also considering the site. Component parts purchased from existing local firms would be assembled at this plant. An expected 75 men will be employed.

A third firm is viewing the site as a location for a small automobile assembly plant. Auto parts will be shipped to the plant, assembled, and the finished product will be shipped from the region. This firm intends to employ about 100 men.

The question before the community is this: which firm should be offered the available industrial site? Everyone agrees that the firm which promises to increase employment most should be selected. On that basis the answer seems clear. The automobile

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assembly plant will employ more men and should be selected.

But a discerning local official has noted that consideration of secondary employment impacts can make the choice more difficult. The radio and TV assembly plant, for example, will purchase component parts locally. Existing firms will then have to expand their operations and will require additional employees. The total increase in employment resulting from selection of the radio and TV assembly plant may be greater than that of the auto assembly plant. The food processing plant may have a similar advantage because of its links to regional fruit and vegetable farms.

In fact, nobody knows what the total employment impact of any of the three alternatives would be and this is what all the argument is about.

The hypothetical community of Dead Man's Fang, as well as other communities faced with a similar question, might well profit from the use of an economic impact analysis technique known as input-output. This technique can provide the estimates of total employment impact the community needs to make an enlightened decision concerning the disposition of the industrial site.

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INPUT-OUTPUT AS AN ECONOMIC IMPACT ANALYSIS TECHNIQUE

Input-Output analysis begins with an accounting of the sales and purchases of local firms within a format known as the transactions table. Table I is an example of such an accounting.¹ The many firms in the region have been assigned to large groups of firms called sectors. The sales of these sectors are recorded along the rows of the table. The purchases are recorded down the columns.

For an example, let us direct our attention to the Services sector. Sales of this sector are recorded in row 9 of the table. Both the amount and the destination of sales are specified. Part of the total sales of the service sector go to other local sectors. Part go to local households. Most of the remainder go to exports. Total sales (or output) amount to over \$36 million.

Purchases are recorded in column 9. Again, both the amount and the source of purchases are specified. Some purchases by the service sector are from other local sectors. Purchases

¹ Tables I, II and III are condensed versions of input-output tables prepared for the Boulder, Colorado area. See William H. Miernyk, et al., Impact of the Space Program on a Local Economy, West Virginia University Library, Morgantown, 1967.

TABLE I

INTERINDUSTRY TRANSACTIONS, BOULDER AREA, 1963^{a/}
(Entries in Thousands of Dollars)

Industry Purchasing Industry Producing	Major Manufac- turing	Space & Space- Related	Contract Construc- tion	Utili- ties	Govern- ment & Education	Extrac- tive	Minor Manufac- turing	Trade	Services	F.I.R.E.	Trans- porta- tion	House- holds	Final Demand		Total Gross Output
													Exports	Other	
1 Major Manufacturing	27.2	80.7	1,321.1	55.2	464.5	5.6	129.7	736.6	353.1	351.3	12.6	883.9	4,471.1	1,074.9	9,967.5
2 Space & Space-Related		165.4			41.2		2.3					15.9	28,983.7	1,038.4	30,246.9
3 Contract Construction	9.3	11.4	5,910.1	33.7	91.6	1.1	6.2	88.4	134.5	117.5	.1	888.3	6,990.	20,429.2	34,711.9
4 Utilities	137.6	333.2	97.5	131.2	783.2	57.3	208.2	1,049.5	1,725.4	222.5	131.2	4,893.3	1,717.	263.5	11,750.9
5 Government & Education	100.0	301.0	187.4	640.3	34.7	26.3	112.2	376.6	1,520.1	113.0	82.6	15,269.8	29,709.7	25.0	48,498.7
6 Extractive	297.1		346.4		13.6	1.2	772.1	150.1	5.7			311.2	1,369.8	767.9	4,035.1
7 Minor Manufacturing	50.7	120.3	533.4		124.2	.3	13.7	194.0	43.9		.4	1,991.9	6,465.1	1,325.7	10,863.6
8 Trade	78.2	141.7	917.6	49.8	437.7	33.4	72.3	525.0	437.5	95.6	76.8	18,878.5	8,657.3	6,695.1	37,096.5
9 Services	250.7	609.9	389.2	128.4	520.0	103.1	208.9	2,252.0	2,967.5	329.4	254.0	18,467.4	9,373.6	794.5	36,649.0
10 F.I.R.E.	193.6	28.2	737.9	52.9	86.8	31.6	125.3	595.7	1,790.5	491.7	42.6	5,177.1	7,124.0	980.2	17,458.1
11 Transportation	118.7	547.8	244.2	51.4	386.1	39.2	71.3	745.4	41.8	15.9	8.4	1,377.2	2,096.0	70.8	5,814.2
12 Households	3,148.3	10,253.1	5,330.9	3,347.1	27,462.9	459.0	3,028.4	14,560.9	12,000.7	5,967.4	2,239.2	11,189.7	64,270.8	6,914.3	170,172.7
13 Imports	4,329.0	9,277.9	12,576.4	5,559.0	18,009.3	2,265.5	4,273.0	9,552.3	9,998.3	8,094.7	1,744.3	89,678.5	16,427.8	15,417.1	207,203.1
14 Other Payments	768.7	7,644.8	877.6	1,701.9	42.9	285.0	631.0	1,913.9	5,072.0	1,659.1	1,222.0	1,150.0	1,500.	2,246.2	26,715.1
15 Inventory Depletions	458.4	731.5	5,242.2			726.5	1,209.0	4,356.1	558.0						13,281.7
16 Total Gross Outlays	9,967.5	30,246.9	34,711.9	11,750.9	48,498.7	4,035.1	10,863.6	37,096.5	36,649.0	17,458.1	5,814.2	170,172.7	189,156.7	58,043.2	664,465.0

a/ Each row shows sales by the sectors at the left to local sectors named at the top of the table and to final demand. Each column reports purchases by the sector at the top from all local sectors, and payments to Imports, Other Payments and Inventory Depletion.

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from households are relatively large. The remaining purchases are mostly imports. Total outlay equals total output -- over \$36 million.

The transactions table is thus an accounting of all transactions by local firms during any study period. The table format emphasizes the interdependence of local sectors. This is the key to the analysis, for the interdependence of sector will give rise to the secondary impacts in which we are interested.

But the transactions table itself does not answer the question posed. Two more tables must be derived. One of those is the so-called direct coefficients table. Table II is an example. Each column contains the expected local purchases of any sector for each dollar of its sales or output. Thus, for every dollar of sales, the service sector will purchase .00978 dollars from local Major Manufacturing firms, .00373 dollars from local Contract Construction, and so on down the column to the Household row where it is seen that payments of over .33 dollars to local households will be required for every dollar of Service sector sales (or output).

A third table, the so-called direct, indirect, and induced table (or total requirements table) is then prepared. (See Table III.) Each entry in this table is an estimate of the total

TABLE II

DIRECT COEFFICIENTS TABLE, BOULDER AREA, 1963^{a/}

	Industry Purchasing	Major	Space &	Contract	Utiliti-	Govern-	Extrac-	Minor			Trans-		
	Industry Producing	Manufac-	Space	Construc-	-ties	ment &	tive	Manufac-	Trade	Services F.I.R.E.	porta-	House-	
		turing	Related	-tion		Education		turing			-tion	holds	
1	Major Manufacturing	.00286	.00273	.04483	.00470	.00958	.00169	.01343	.02250	.00978	.02012	.00217	.00519
2	Space & Space Related		.00560			.00085		.00024					.00009
3	Contract Construction	.00098	.00039	.20055	.00287	.00189	.00033	.00064	.00270	.00373	.00673	.00002	.00522
4	Utilities	.01447	.01129	.00331	.01117	.01615	.01732	.02156	.03206	.04781	.01274	.02257	.02875
5	Government & Education	.01052	.01020	.00636	.05449	.00072	.00795	.01162	.01150	.04212	.00647	.01421	.08973
6	Extractive	.03124		.01175		.00028	.00036	.07997	.00458	.00016			.00183
7	Minor Manufacturing	.00533	.00408	.01810		.00256	.00009	.00142	.00593	.00122		.00007	.01171
8	Trade	.00822	.00480	.03114	.00424	.00902	.01009	.00749	.01604	.01212	.00548	.01321	.11094
9	Services	.02636	.02066	.01321	.01093	.01072	.03116	.02164	.06878	.08222	.01887	.04369	.10852
10	F.I.R.E.	.02036	.00096	.02504	.00450	.00179	.00955	.01298	.01819	.04961	.02816	.00733	.03042
11	Transportation	.01248	.01856	.00829	.00437	.00796	.01185	.00739	.02277	.00116	.00091	.00144	.00809
12	Households	.33108	.34738	.18089	.28484	.56626	.13873	.31367	.44474	.33251	.34181	.38513	.06575

^{a/} Each column shows direct purchases from the sectors at the left per dollar of adjusted gross output by the sector at the top.

TABLE III

DIRECT, INDIRECT AND INDUCED REQUIREMENTS PER DOLLAR DELIVERY
TO FINAL DEMAND (INVERTED TABLE), BOULDER AREA, 1963 a/

Industry Purchasing Industry Producing		Major Manufac- turing	Space & Space- Related	Contract Construc- tion	Utili- ties	Govern- ment & Education	Extrac- tive	Minor Manufac- turing	Trade	Services	F.I.R.E.	Trans- porta- tion	House- holds
1	Major Manufacturing	1.01033	.00952	.06358	.01115	.01963	.00563	.02063	.03331	.02021	.02777	.01034	.01577
2	Space & Space Related	.00011	1.00574	.00009	.00013	.00100	.00005	.00034	.00015	.00015	.00010	.00012	.00025
3	Contract Construction	.00598	.00500	1.25504	.00764	.00919	.00282	.00542	.01017	.01089	.01318	.00536	.01119
4	Utilities	.03972	.03541	.02698	1.03235	.05146	.03042	.04687	.06882	.08031	.03689	.05078	.05688
5	Government & Education	.06485	.06389	.05306	.10105	1.08223	.03495	.06514	.08944	.10920	.06026	.07612	.13453
6	Extractive	.03392	.00251	.02025	.00206	.00402	1.00148	.08262	.00883	.00321	.00287	.00250	.00528
7	Minor Manufacturing	.01222	.01095	.02874	.00617	.01315	.00339	1.00816	.01573	.00948	.00709	.00788	.01759
8	Trade	.06939	.06569	.08979	.05776	.10255	.03910	.06742	1.10172	.08402	.06660	.08218	.15691
9	Services	.09947	.09205	.08015	.07274	.11800	.06754	.09404	.17344	1.17164	.09032	.12588	.17662
10	F.I.R.E.	.04470	.02402	.05343	.02448	.03614	.02209	.03696	.05385	.08150	1.05235	.03465	.05571
11	Transportation	.01976	.02543	.01777	.01068	.01831	.01535	.01519	.03290	.00984	.00795	1.00931	.01657
12	Households	.51273	.51518	.41675	.45060	.79735	.23993	.49837	.71508	.59454	.51516	.58205	1.34857
Total		1.91318	1.85539	2.10563	1.77681	2.25303	1.46275	1.94116	2.30344	2.17499	1.88054	1.98717	1.99587

a/ Each column entry shows the direct, indirect and induced output required from the sectors at the left to support the delivery of one dollar's worth of output to final demand by the sector named at the top of the column. Each column sum (in the Total row) is the relevant sector multiplier, and is an estimate of total required production from all sectors in the community to support the delivery of one dollar to final demand by the sector named at the top of the column.

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production required from the sector named at the left of the row to support an exchange of one dollar in sales to final demand (exports, essentially) by the sector at the top of the column.

Let us continue the Services sector example. Column 9 of Table II shows that for every dollar of added service sector sales to exports, all local sectors are motivated to increased sales. Local major manufacturing must produce another .02 dollars annually, local contract construction an additional .01 dollars, local utilities .08 dollars. etc.

The last entry in each column is the "multiplier". In column 9 we find the estimate that an additional one dollar sale to exports by the service sector will stimulate over two dollars of total new community production.

The relevance of this kind of information to the question before our hypothetical community is clear. An estimate of each alternative firm's total impact on community production levels can be gained from a table such as Table III. Further, each firm's total impact on community production can be translated into estimates of that firm's total impact on community employment. This is the information for which the community has been searching.

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While the completed tables are easy to use and specifically directed to the question at hand, they are difficult and expensive to develop. Data collection alone can be prohibitive and, even where cost is not prohibitive, an expensive economic study absorbs resources which could be applied to other important uses.

Technique for Area Planning (TAP), developed by the Regional Economic Development Institute under contract with EDA, affords an escape from the dilemma. It was designed to provide an impact analysis technique with many of the same uses as conventional input-output, but at substantially less cost.

TECHNIQUE FOR AREA PLANNING (TAP)

Technique for Area Planning can best be described in comparison with conventional input-output. Table I contains 12 local sectors -- 11 groups of local firms and one group of households. TAP begins by designating some of these local groups as major and the rest as minor.

Major employers are those large, easily identifiable firms which are considered the "prime movers" of the economy. Regional growth follows their lead. Minor sectors are all other sectors in the economy.

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Complete information on sales and purchases is obtained from firms in the major sectors through comprehensive personal interviews with each major employer. Limited information is obtained from minor sectors through a mail questionnaire sample survey.

The information so gained from both major and minor sectors, coupled with data published principally by the Census Bureau or Labor Department, is recorded in a transactions table format. Adjustments are then made to Household receipts and expenditures to compensate for our limited information on minor sector operations.

Table IV is an example of a TAP transactions table. A comparison of this table with Table I shows the essential differences between TAP and conventional input-output. The result of our limited collection of data from minor sectors is immediately apparent. Table IV shows no transactions among minor sectors, although transactions between the minor and major sectors continue to be recorded. This procedure has gained substantial cost advantages for the technique. To compensate for the loss of those transactions, the Household row and column of Table IV are adjusted upward, as a quick comparison with Table I will show.

TABLE IV

MODIFIED INTERINDUSTRY TRANSACTIONS, BOULDER AREA, 1963^{a/}
 (Entries in Thousands of Dollars)

Industry Purchasing Industry Producing	Major Manufac- turing	Space & Space- Related	Contract Construc- tion	Utili- ties	Govern- ment & Education	Extrac- tive	Minor Manufac- turing	Trade	Services	F.I.R.E.	Trans- porta- tion	House- holds	Final Demand		Total Gross Output
													Exports	Other	
1 Major Manufacturing	27.2	80.7	1,321.1	55.2	464.5	5.6	129.7	736.6	353.1	351.3	12.6	883.9	4,471.1	1,074.9	9,967.5
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3 Contract Construction	9.3	11.4	5,910.1	33.7	91.6	1.1	6.2	88.4	134.5	117.5	.1	888.3	6,990.	0,429.2	34,711.9
4 Utilities	137.6	333.2	97.5	131.2	783.2	57.3	208.2	1,049.5	1,725.4	222.5	131.2	4,893.3	1,717.	263.5	11,750.9
5 Government & Education	100.0	301.0	187.4	640.3	34.7	26.3	112.2	376.6	1,520.1	113.0	82.6	15,269.8	29,709.	25.0	48,498.7
6 Extractive	297.1		346.4		13.6							1,240.3	1,369.8	767.9	4,035.1
7 Minor Manufacturing	50.7	120.3	533.4		124.2							2,244.2	6,465.1	1,325.7	10,863.6
8 Trade	78.2	141.7	917.6	49.8	437.7							20,119.1	8,657.3	6,695.1	37,096.5
9 Services	250.7	609.9	389.2	128.4	520.0							24,582.3	9,373.6	794.5	36,649.0
10 F.I.R.E.	193.6	28.2	737.9	52.9	86.8							8,254.5	7,124.0	980.2	17,458.1
11 Transportation	118.7	547.8	244.2	51.4	386.1							2,299.2	2,096.0	70.8	5,814.2
12 Households	3,148.3	10,253.1	5,330.9	3,347.1	27,462.9	575.0	3,730.2	17,039.2	14,937.1	6,485.4	2,451.5		64,270.8	6,914.3	170,172.7
13 Imports	4,329.0	9,277.9	12,576.4	5,559.0	18,009.3	2,265.5	4,273.0	9,552.3	9,998.3	8,094.7	1,744.3	89,678.5	16,427.8	15,417.1	207,203.1
14 Other Payments	768.7	7,644.8	877.6	1,701.9	42.9	285.0	631.0	1,913.9	5,072.0	1,659.1	1,222.0	1,150.0	1,500.	2,246.2	26,715.1
15 Inventory Depletions	458.4	731.5	5,242.2			726.5	1,209.0	4,356.1	558.0						13,281.7
16 Total Gross Outlays	9,967.5	30,246.9	34,711.9	11,750.9	48,498.7	4,035.1	10,863.6	37,096.5	36,649.0	17,458.1	5,814.2	170,172.7	189,156.7	58,043.2	664,465.0

a/ Each row shows sales by the sectors at the left to local sectors named at the top of the table and to final demand. Each column reports purchases by the sector at the top from all local sectors, and payments to Imports, Other Payments and Inventory Depletion. Minor sector sales to Households and purchases from Households have been modified as discussed in text. Minor sector transactions among themselves are zero by assumption.

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The modified transactions table of TAP is now treated exactly like the transactions table of conventional input-output. Two further tables are derived, the second one containing estimates of each sector's total impact on community production levels. Again, these estimates can be translated into estimates of total employment impact.

Tests show that the estimates obtained with TAP are not substantially different from those obtained with conventional input-output. In a test involving seven regions of diverse size and economic structure, TAP produced estimates varying on the average by less than 5% from those produced by conventional input-output. The technique is especially suited to medium-sized or small regions with fairly specialized economies. It is less suitable for the larger urban areas.

CONCLUSION

The citizens of Dead Man's Fang may now rest easily. Intelligent use of TAP will provide them with estimates of the total employment impact on each alternative firm. And these estimates are relatively inexpensive.

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The clamour in Dead Man's Fang subsides. The Industrial Development Organization is now busy preparing estimates of total and secondary employment impact, and the decision will rely on these estimates.

But there is a question from the rear.

Yes?

"Which firm will pollute our air and water most?"